LOW ORDER DETONATION DEBRIS

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Extent of Problem

- **Examples from Ranges**
- **Experimental LODs**
- **Fate of energetics**
- **LOD *plus* BIP of UXO**

Alternatives to Blow-in-Place

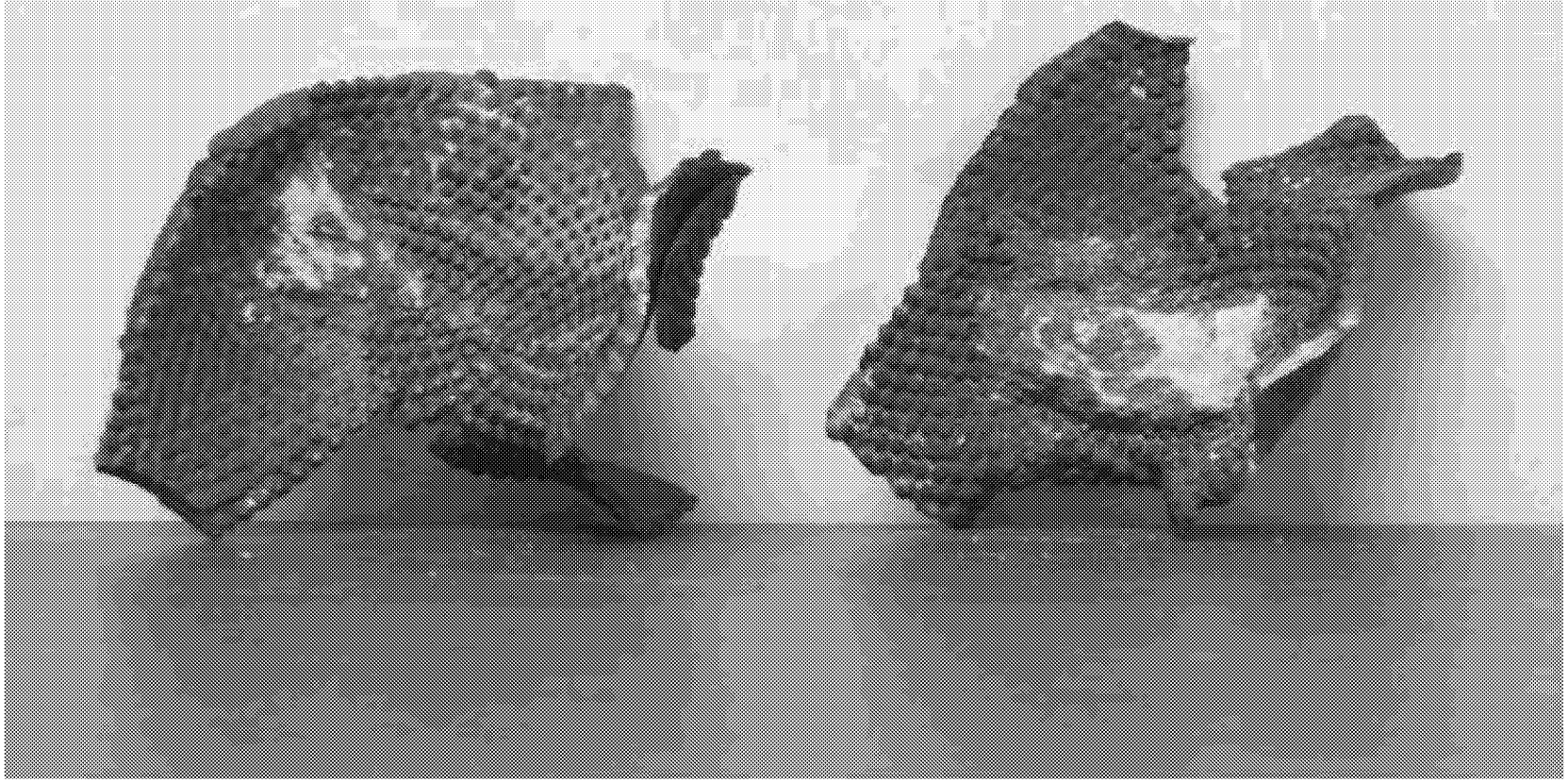
Range Characterization Tools

On-Range Remediation

155mm artillery-TNT

BLU97-submunition
Cyclotol 70%RDX / 30%TNT

Weathered Grenade Fragments-TNT in CompB degrades, producing the dark reddish coating. Sections of this have abraded, revealing fresh, white CompB.



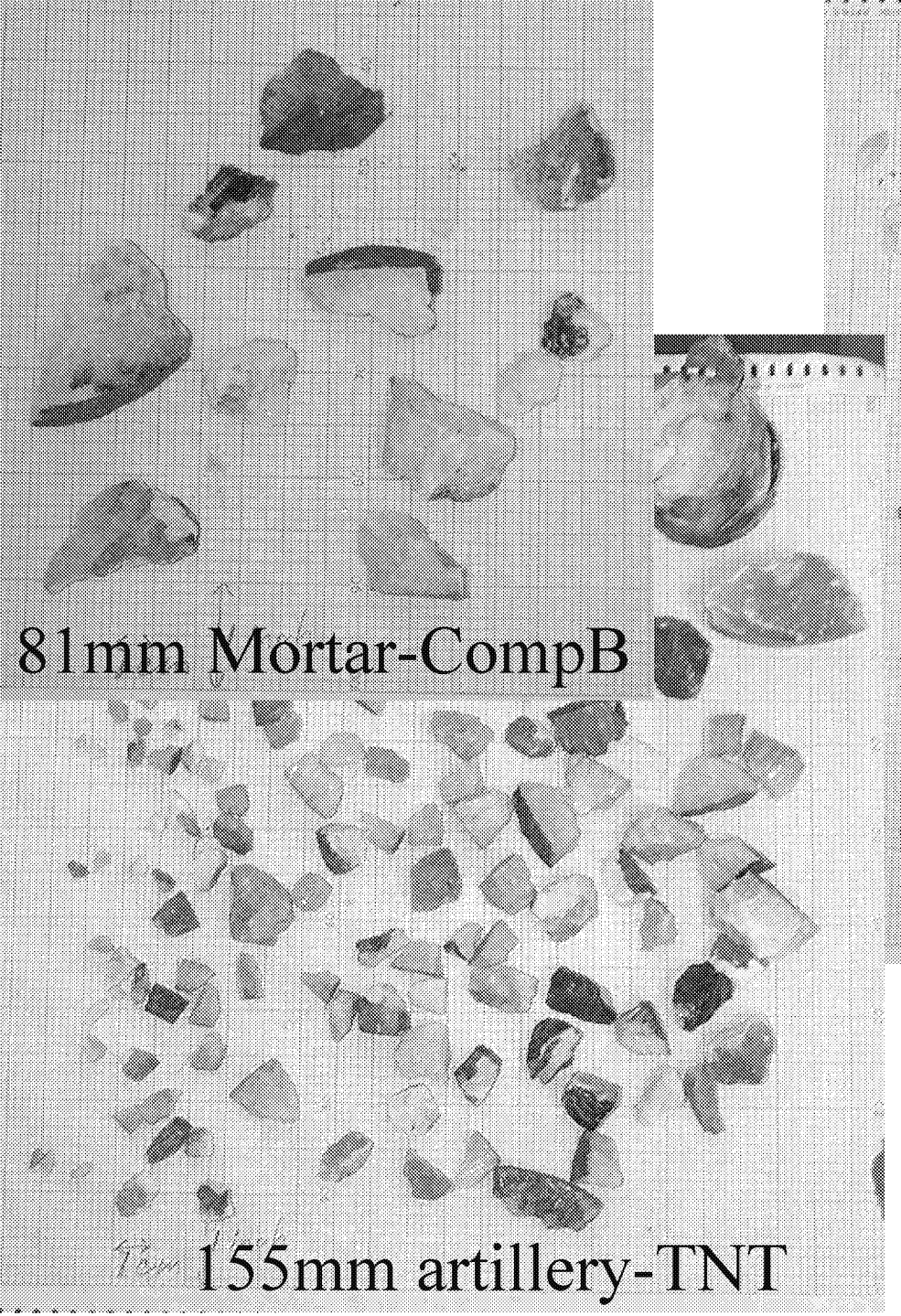
Range Rocks?

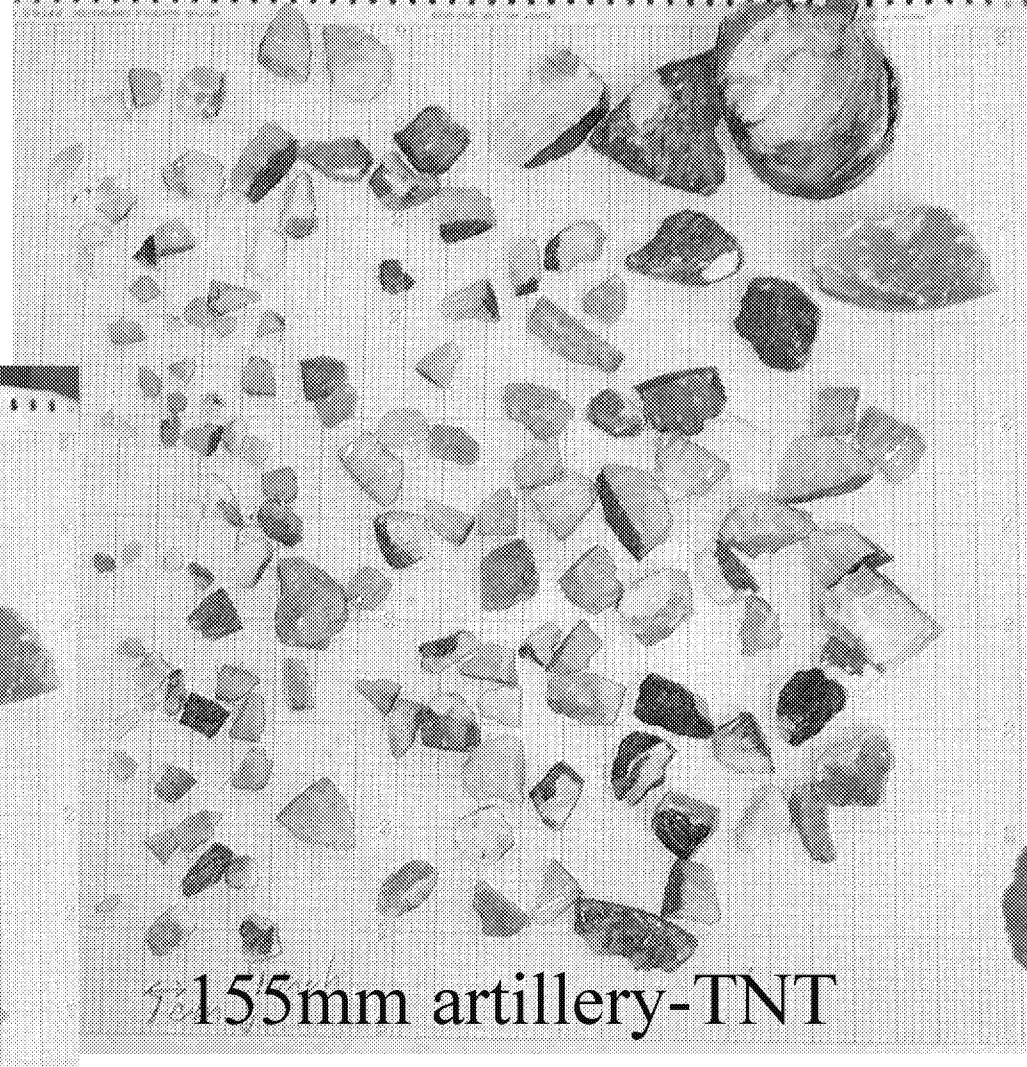
Tritonal 80% TNT/ 20% Aluminum

LOD estimates may not be accurate.

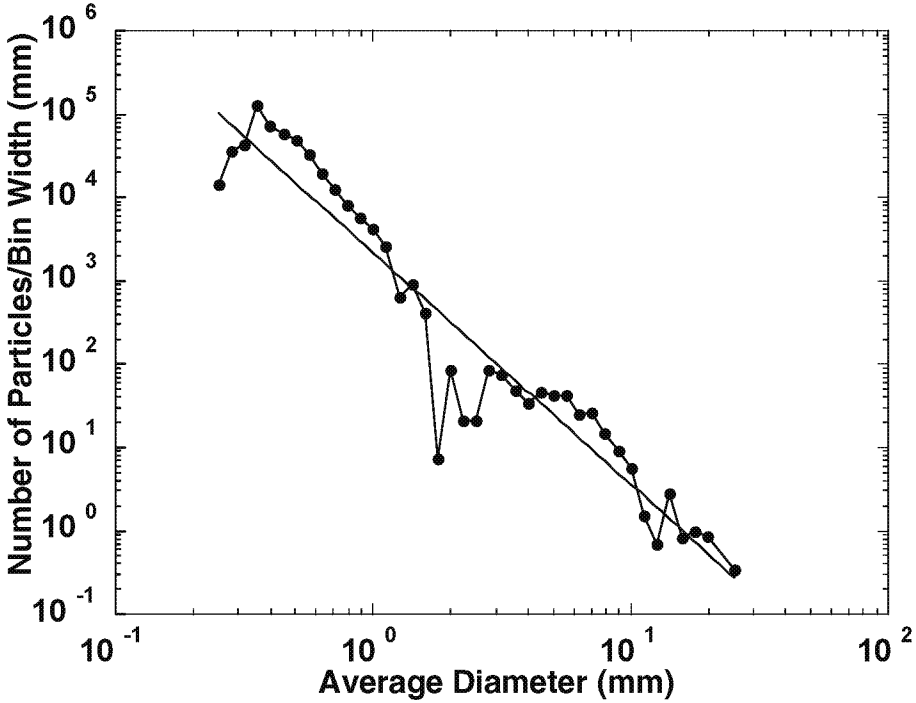
e.g. BLU-97 submunitions listed at 2-3%
EOD personnel plan on 20%

A LOD over 50% can not be distinguished from a high order by range spotters.





Experimental LOD
Blossom Point, MD-
Drs.Taylor,Lever,Pennington



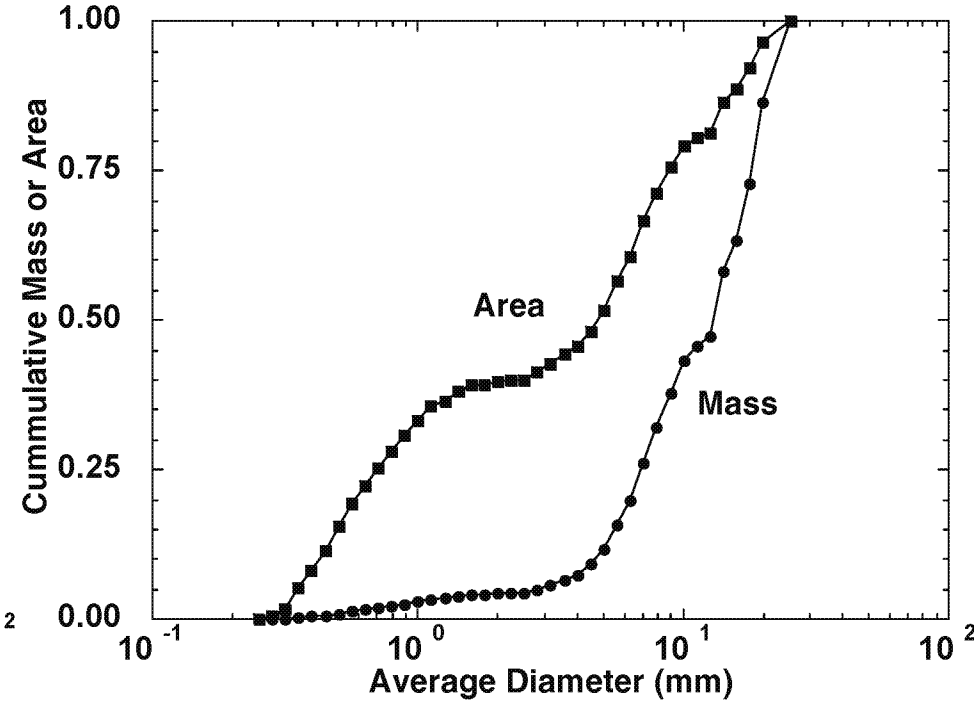
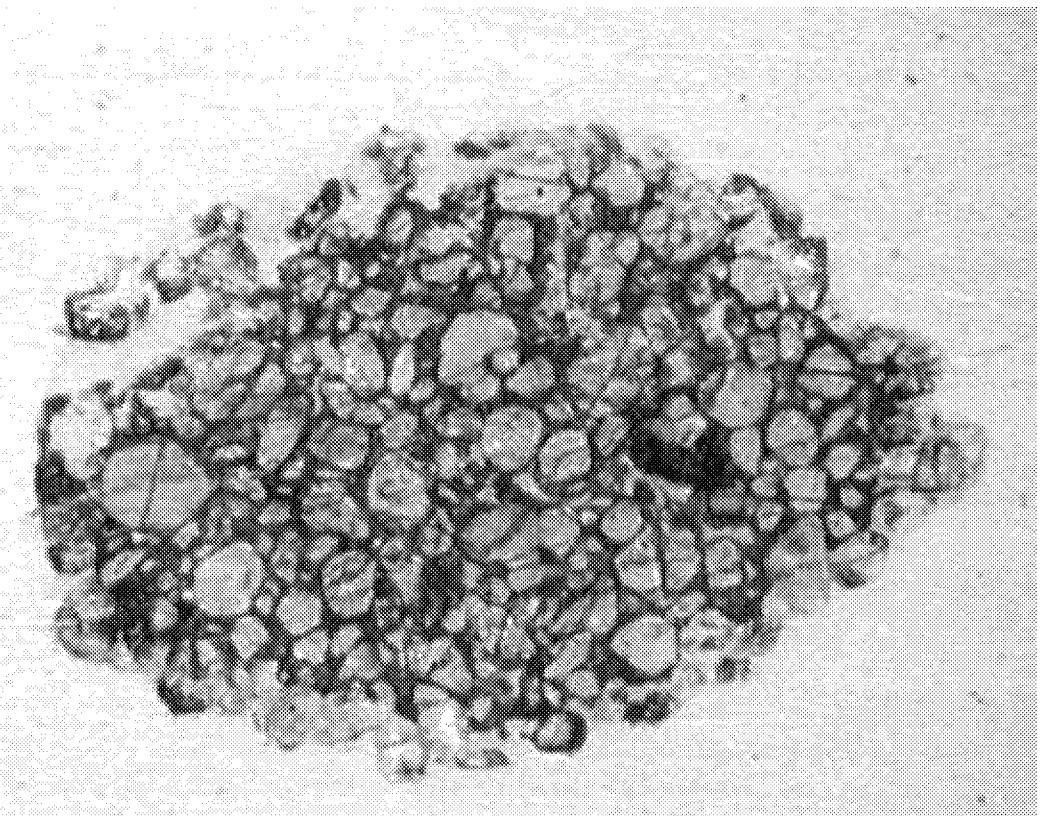
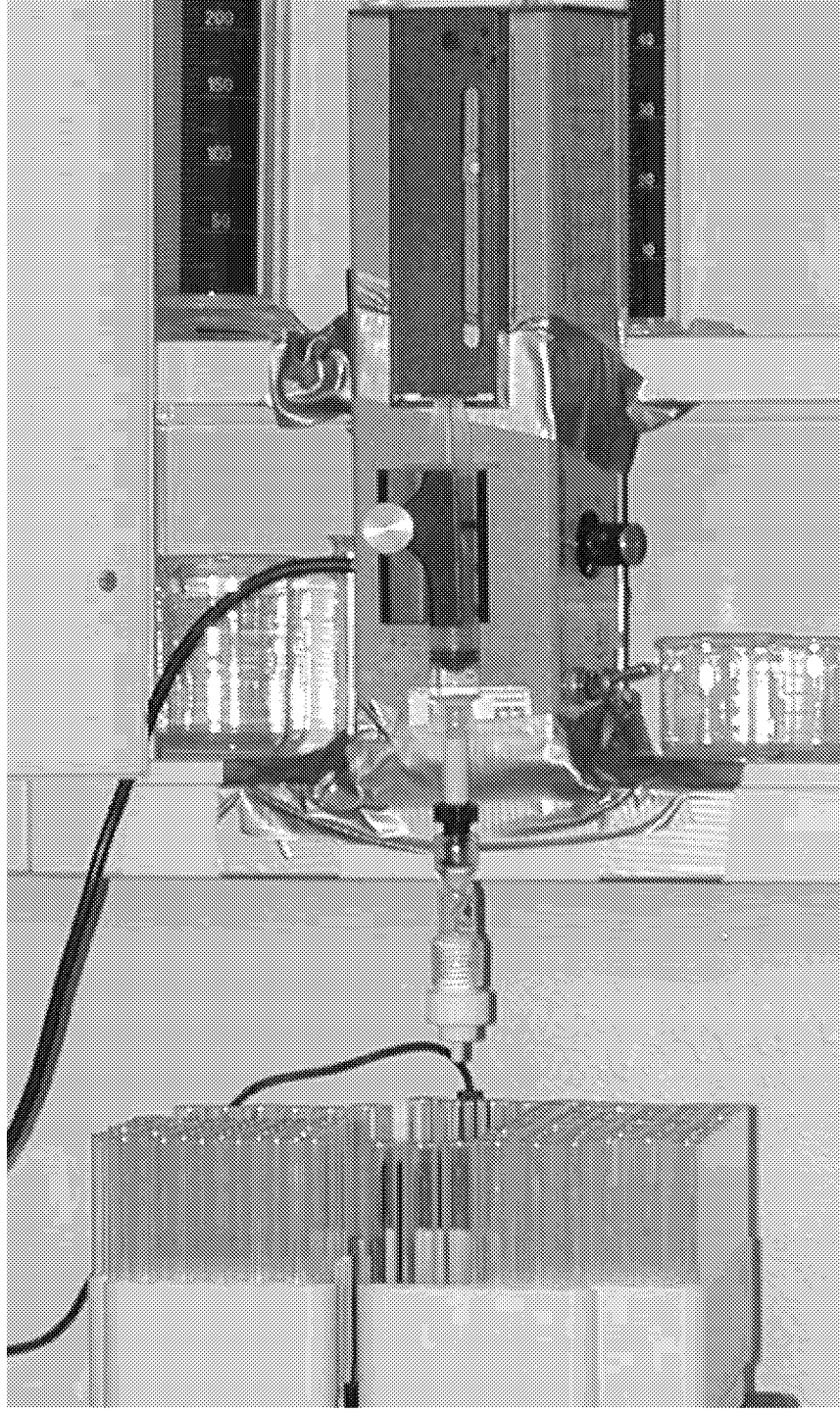


FIGURE 3. Size distribution of CompB from LO-1.

FIGURE 4. Cumulative surface area and mass of CompB from LO-1. The total mass was 0.202 kg, and the total surface area was 0.11 m^2. The data for particles <0.25 mm are not included.

CompB weathering studies-
Dr. Susan Taylor-CRREL





Sieved range soils-TNT particles revealed with color reagent

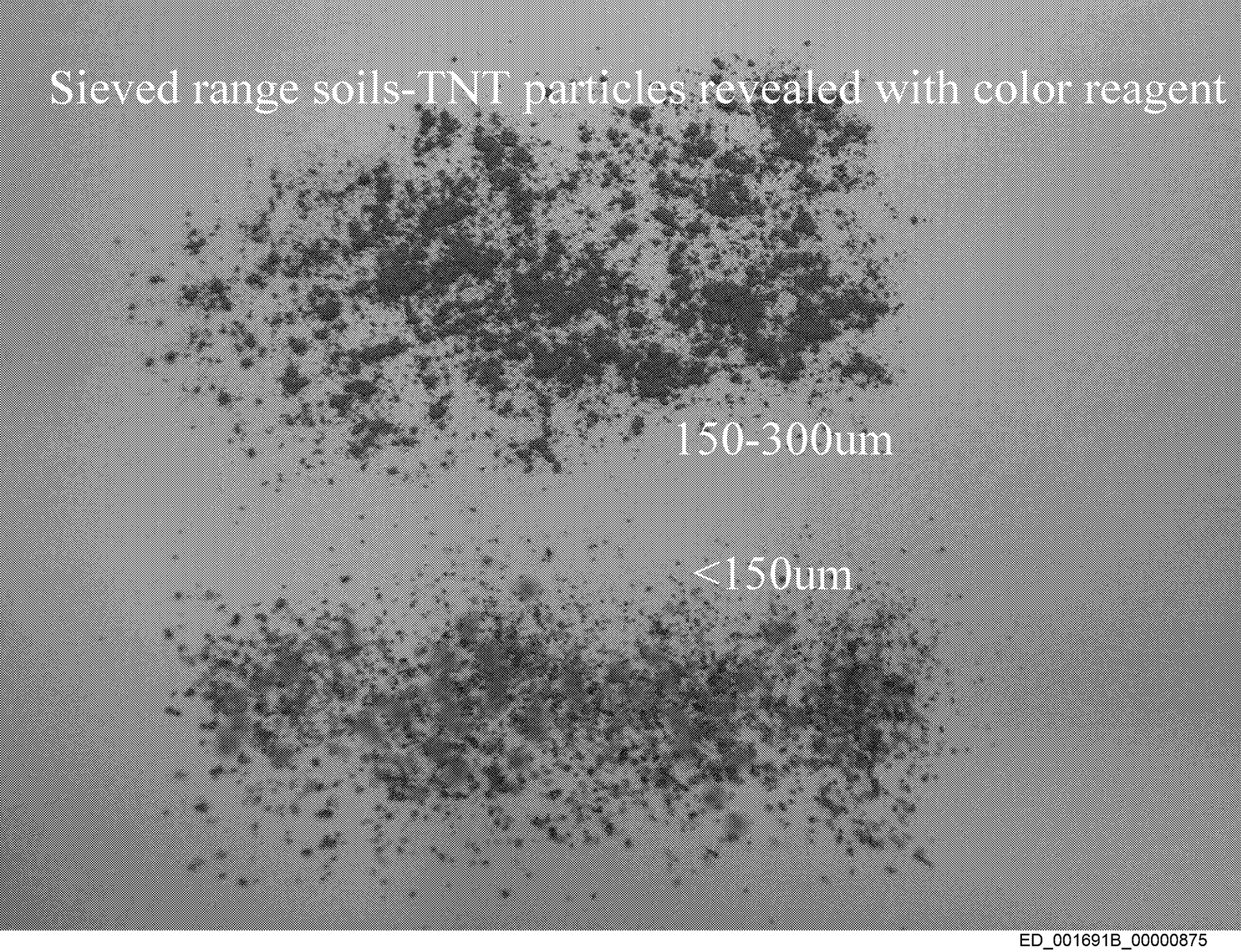
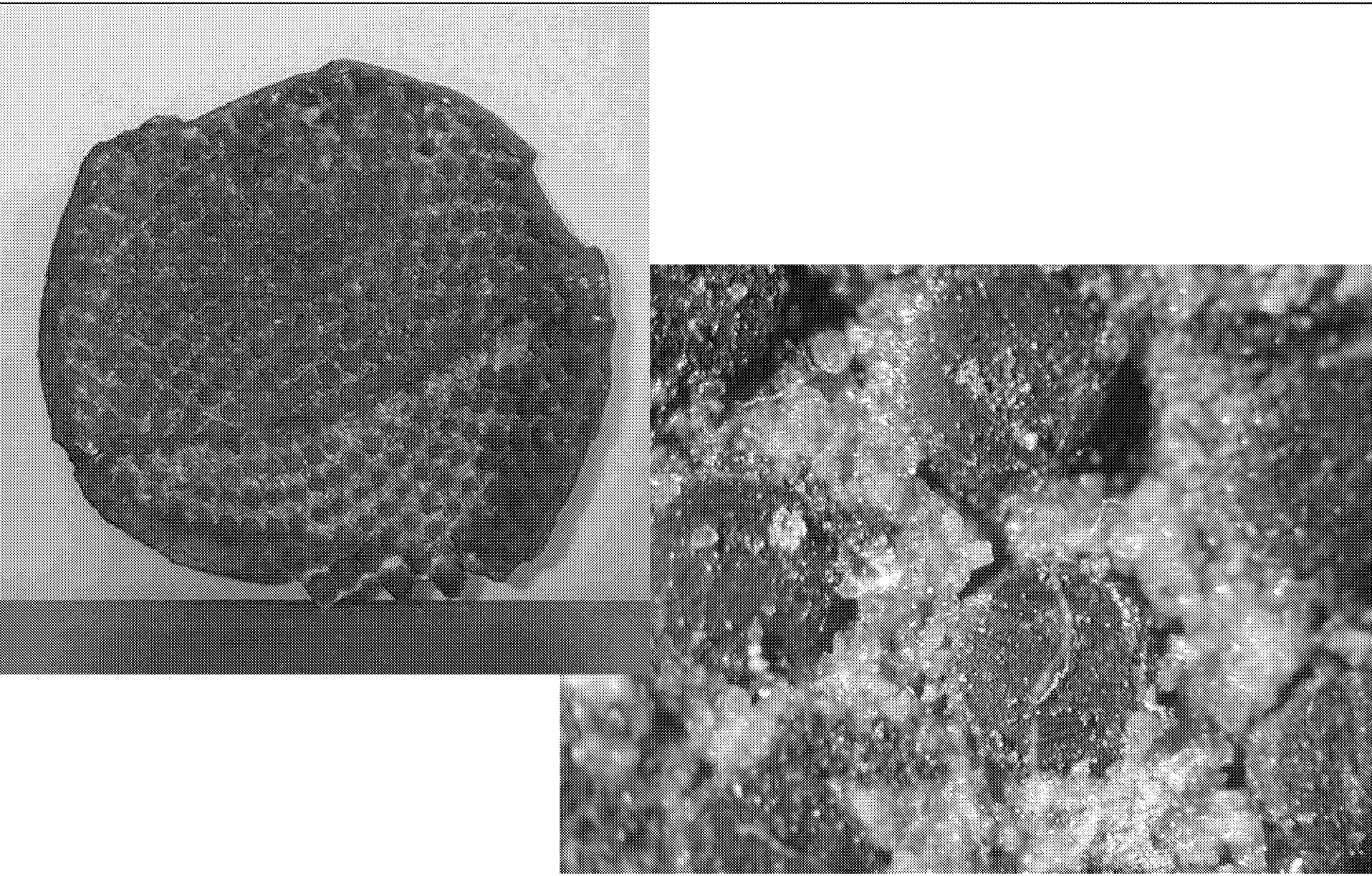


Figure 1. Weathered grenade fragment showing decomposition of CompB to produce loose RDX crystals.



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UXO and some LOD are subject to BIP

sub-munitions

illumination rounds-perchlorate

Either shot or detonated using C4 (RDX)

can create more LOD debris-

illumination rounds VERY messy

Alternatives-lasers or torches

no C4..but generally more LODs

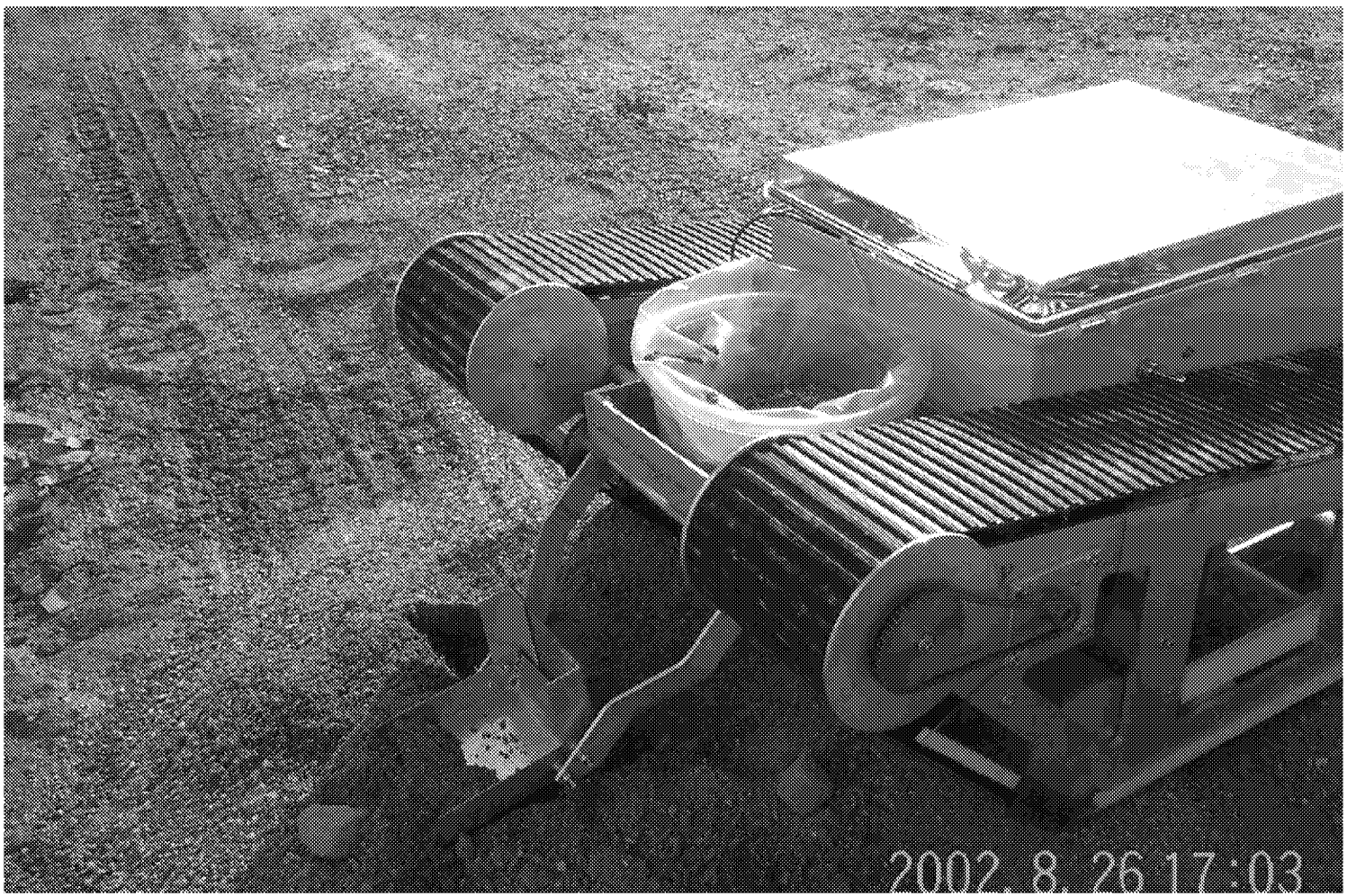
Range characterization-data gaps

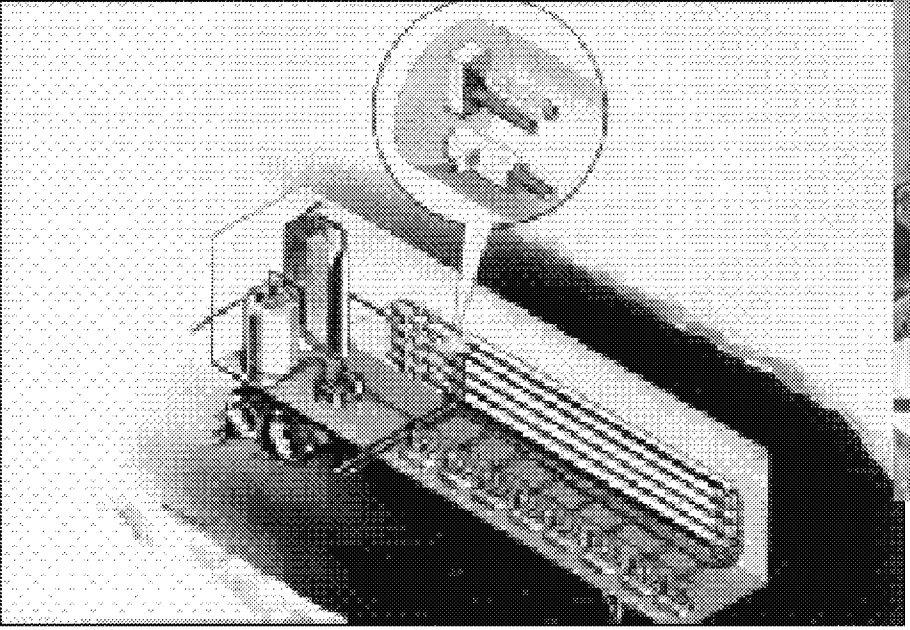
chunk energetics NOT associated with shrapnel

perchlorate?

spotting charges, flares
illumination rounds
rocket propellant-either unspent on impact or spit out on firing lanes.

Range Sampling Robot-Dr. Jim Lever-CRREL
Hot-Spot Robot-with IMS -ARA





Los Alamos-BH/SCWO

Actodemil®-Arctech
BH/humic acid. Same scale as LANL.
UXBase™-UXB
BH-neutralize, sewage
Thermal-Army, Navy (CBF) flashing furnaces

INEEL-acetone to compost

Catalytic Hydrothermal Conversion

APPLIED RESEARCH ASSOCIATES, INC.